# UNITED STATES PATENT AND TRADEMARK OFFICE

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/711,191 | 11/24/2004 | Weimin Xiao | CML01326T | 5190 |

22917          7590          02/27/2009

MOTOROLA, INC.
1303 EAST ALGONQUIN ROAD
IL01/3RD
SCHAUMBURG, IL 60196

| EXAMINER |
|---|
| BROWN JR, NATHAN H |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2129 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 02/27/2009 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

Docketing.US@motorola.com

| | Application No. | Applicant(s) |
|---|---|---|
| | 10/711,191 | XIAO ET AL. |
| Office Action Summary | Examiner | Art Unit | |
| | NATHAN H. BROWN JR | 2129 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>(3)</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 December 2008*.

2a)☒ This action is FINAL.        2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

# Examiner's Detailed Office Action

1.  This Office Action is responsive to the communication for
application 10/711,191, filed December 22, 2008.

2.  Claims 1-19 are pending.  Claims 1-19 are currently amended.

3.  After the previous office action, claims 1-19 stood
rejected.

# Claim Rejections - 35 USC § 101

4.  35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine,
manufacture, or composition of matter, or any new and useful improvement
thereof, may obtain a patent therefor, subject to the conditions and
requirements of this title.

The claims fail to provide a tangible result, and a practical
application, by either
1) transforming (physical thing) or
2) by having the FINAL RESULT (not the steps) achieve or produce
   a useful (specific, substantial, AND credible),
   concrete (substantially repeatable/non-unpredictable), AND
   tangible (real world/non-abstract) result.

A claim that is so broad that it reads on both statutory and non-statutory subject matter, must be amended. A claim that recites a computer that solely calculates a mathematical formula is not statutory.

However, the portions of the opinions in State Street and AT&T relying <u>solely</u> on a "useful, concrete and tangible" result analysis *should no longer be relied on*. Ex parte Bilski, Appeal No. 2007-1130 (Fed. Cir. October 30, 2008.

The court has said that there's a two-pronged test to determine whether a software of method process patent is valid: (1) it is tied to a particular machine or apparatus, or (2) it transforms a particular article into a different state or thing. In other words, pure software or business method patents that are neither tied to a specific machine nor change something into a different state are not patentable. Ex parte Bilski, Appeal No. 2007-1130 (Fed. Cir. October 30, 2008).

The applicant is asked to answer the following:

What is the practical application of "summing … summands"? If they believe there is a clear practical application where does the disclosure define said application such that it does not read on unknown uses and does not preempt?

How is the claimed invention tied to a statutory class?

What is the particular machine?

5. Claims 1-12 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter: mathematical abstraction and/or algorithm. Independent claim 1 recites an "electrical neural network" comprising a plurality of

nodes and directed edges and a training process.  The final
result recited is "summing the first summand and the additional
summands, wherein, in estimating said derivative, paths from
said second node to said output node that involve said third
plurality of directed edges are not considered".  Examiner
considers the list of nodes and edges recited to be no more that
a recitation of a graph model.  Examiner considers the training
process to be an algorithm.  Therefore claim 1 is considered to
recite only the 101 judicial exceptions of mathematical
abstraction and algorithm and to thus be non-statutory under 35
U.S.C. 101.  Claims 2-12 provide detailed algorithm limitation
to claim 1 and thus fail to cure the deficiency of claim 1.
Examiner considers graph models asserted to comprise electrical
circuits to be no more than circuit (or electrical, wiring,
elementary) diagrams or electronic schematics.  Such diagrams
are considered to be simplified conventional pictorial
representations of circuits (i.e., abstractions).  Therefore,
claims 1-12 are considered to be non-statutory under 35 U.S.C.
101.


6.  Claims 13-19 are rejected under 35 U.S.C. 101 because the
claimed invention is directed to non-statutory subject matter:
algorithm.  Independent claim 13 recites a "method of training

an electrical neural network" with the graph structure of

independent claim 1. The final result of the training is

"summing the first summand and the additional summands, wherein,

in estimating said derivative, paths from said second node to

said output node that involve said third plurality of directed

edges are not considered" is considered to simply be a

computational state or numerical value representing no credible

or specific real-world result.  Claim 13 is not considered to

satisfy the Machine prong of the Machine or Transformation test

of In re Bilski as the Machine prong of the Machine or

Transformation test requires that claimed subject matter be tied

to a particular machine.  Claim 13 recites only additions and

multiplications which could be carried out as mental processes

supported by writing out intermediate results on paper.  Claims

14-19 provide detailed algorithmic limitation to claim 13, but

fail to cure the deficiency of claim 13. Examiner considers

"computing" a value of a derivative of an objective function and

"processing" a derivative of an objective function with an

optimization algorithm that uses derivative information, recited

in claim 14, to comprise of no more than multiplications and

additions once the calculus operations have been performed on

said function.  Again, these operations could be carried out as

mental processes supported by writing out intermediate results

on paper. Therefore, claims 13-19 are considered non-statutory

under 35 U.S.C. 101.

# Response to Arguments

7. Applicant's arguments filed December 22, 2008 have been

fully considered.

### Rejection of Claims 1-19 Under 35 U.S.C. §112, 1st

Applicant(s) argue(s):

> In respect to 35 USC §101 the Examiner has rejected the
> Applicants' claims as failing to read on statutory subject
> matter, not for reciting subject matter (inventions) that
> lack utility. Therefore, rejection under 35 U.S.C. §112, 1¶
> 1 is not properly founded on a failure to meet 35 USC §101
> and for this reason the Applicant submits that a proper
> prima facie rejection under 35 U.S.C. §112, 1¶ 1 has not
> been made and withdrawal of the rejection under 35 U.S.C.
> §112, 1¶ 1 is requested.

Examiner responds:

> Examiner finds applicant(s) argument persuasive and
>
> withdraws the utility rejection under 35 U.S.C. §112, 1¶.

### Rejection of Claims 1-19 Under 35 U.S.C. §101

Applicant(s) argue(s):

> The Applicant has amended the claims to change "neural
> network" in the preambles to "electrical neural network".
> This change is supported by paragraph 27 of the

specification. The claims as filed and as amended would be construed by persons of ordinary skill in the art of neural networks to read on an electrical neural network.

Examiner responds:

Applicants' change of "neural network" to "electrical neural network" does not change the 101 status of the application as electrical neural networks are a well known class of scientific models which include the Hodgkin-Huxley 'electrical' model. To avoid the suggestion of abstraction, applicant should clearly claim either an electronic or electrical *implementation* of a specific 'electrical neural network model' (that is supported in the specification) having a specific and credible real-world application.

Applicant(s) argue(s):

"Nodes, edges, weights are clearly recognizable as entities from the theory of directed graphs."
Applicant would like to point out that electrical engineering is a highly mathematical subject and thus it is no surprise at all that mathematical concepts is useful in electrical engineering. For example Laplace transforms are widely used in electrical engineering to describe and analyze linear circuits. Laplace transforms are also presented in numerous claims in issued patents. The Applicant would ask rhetorically: does the fact that Laplace transforms-clearly a mathematical subject are eminently useful and widely used in connection with linear circuits mean that linear circuits are non-statutory subject matter ?- most certainly it does not. By the same token the usefulness of graph theory in the field of neural networks does not taint the field so as to make neural networks non-statutory.

Examiner responds:

Examiner reminds applicant that the way mathematical

abstractions are used in electrical engineering "to

describe and analyze linear circuits" does not apply in

seeking patent protection.


Applicant(s) argue(s):

The Examiner also states that: "arithmetic operations over
nodes, edges, and weights are well known in simple vector-
matrix arithmetic." Be that as it may, it is not at all
germane to the neural networks disclosed by the Applicant
or the pending claims, because neural networks are
necessarily non-linear as opposed to linear and simple
vector-matrix arithmetic is insufficient.

Examiner responds:

Examiner disagrees. Vector-matrix arithmetic is quite

sufficient for the application of non-linear squashing

functions (e.g., the logistic function) as used in well

known neural networks like error backpropagation.


## In re Bilski

Applicant(s) argue(s):

As noted above the Examiner has agreed that neural networks
have utility, so the issue under 35 U.S.C. to be addressed
is whether the claims are drawn to statutory subject matter
(whether they define "patent-eligible" subject matter). The
recent CAFC case In re Bilski which has substantially
refocused the criteria to be applied in judging whether

method claims define statutory subject matter under 35 USC
§101 is relevant to the Applicants' claims. In re Bilski
has put forth two alternative criteria for qualifying under
35 USC §101 which are collectively called the Machine or
Transformation test. The former alternative requires that
claimed subject matter be tied to a particular machine. The
present Applicants' claims are perhaps an ideal fit to the
Machine prong of the test as enunciated in In re Bilski. In
the case of the subject matter covered by the Applicants'
claims the process steps are intimately connected a
particular machine, i.e. electrical neural network. Details
of the machine, i.e., neural network are recited in some
detail (about half of the independent claims) along with
the method steps. The claims recite extensive details of
the Machine, i.e., the electrical neural network and then
recite method steps which recite various actions and which
specifically refer to the recited details of the machine in
defining those actions. Thus it is submitted that the
Applicants' claims are clearly statutory under the criteria
for satisfying 35 USC §101 that has been articulated in In
re Bilski.

Examiner responds:


Examiner disagrees.  Examiner considers 'electrical neural

networks' to be a class of scientific model (*see* above).

While such models *may* be implemented in hardware, they are

clearly not restricted to such an implementation given the

large number of software simulations well known in the art.

Therefore, there is no reason to take it as implicit that

an 'electrical neural network' is a machine.


While applicant suggests and hardware implementation:

> "[Para 27] In an electrical hardware implementation of
> the invention, the directed edges (e.g., 120, 122) are
> suitably embodied as attenuating and/or amplifying

> circuits. The processing nodes 11 0, 112, 114, 116
> receive the bias signal and input signals from the
> four inputs 102-1 08. The bias signal and the input
> signals are multiplied by weights associated with
> directed edges through which they are coupled."

> "[Para 35] The other processing nodes 112, 114, 116
> preferably have the same design as shown in FIG. 2,
> with the exception that the other processing nodes
> include summers with different numbers of inputs in
> order to accommodate input signals from the neural
> network inputs 102-108 and from other processing
> nodes. In a hardware implementation of the neural
> network, the first processing nodes and other
> processing nodes are implemented in digital or analog
> circuitry or a combination thereof."

applicant does not *claim* a hardware implementation.   As

applicant states:

> "[Para 21] FIG. 14 is a block diagram of a computer
> used to execute the algorithms shown in FIGs. 7, 13
> according to the preferred embodiment of the
> invention."  [emphasis, examiner's]

Further, applicant states:

> "[Para 48] FIG. 7 is a flow chart of a method 700 of
> training neural networks of the general type shown in
> FIG. 1 according to the preferred embodiment of the
> invention. Although the method 700 is preferably
> performed using a computer model of a neural network,
> the results found using the method, can then be
> applied to a hardware implemented neural network."
> [emphases, examiner's]

Examiner interprets this to mean that applicant's invention

is a computer model (or algorithm) that can be used to find

a   neural   network   interconnect   structure   that   can

*subsequently* be implemented in hardware.


While applicant asserts that

> "The claims recite extensive details of the Machine, i.e., the electrical neural network and then recite method steps which recite various actions and which specifically refer to the recited details of the machine in defining those actions"

examiner finds only claims 2 and 3 listing circuit components. Examiner considers graphs (nodes and edges) mapped to circuit components to be no more than circuit (i.e., electrical, wiring, or elementary) diagrams or schematics. Such diagrams are considered to be conventional pictorial representations of circuits (i.e., abstractions). Claim 13 assigns graph components (nodes and edges) "for transmitting signals". This mapping of abstract graph structures to a signal transmitting role further supports the notion that applicants' invention is directed toward mathematical modeling. Examiner finds no disclosure of the process of training the neural network in terms of electrical circuit operations. Examiner finds no disclosure of estimating derivatives in terms of electrical circuit operations. Examiner finds no disclosure of computing the sigmoid transfer function in terms of electrical circuit operations. Examiner maintains the

rejection of claims 1-19 under 35 U.S.C. §101 as

abstraction and/or algorithm.

Comments on Use of Product-by-Process Claims

Applicant(s) argue(s):

Applicants' claims 1-12 are product-by-process claims which
are infrequently used in electrical cases, however are
appropriate in this particular case. There are various
prior art training methods for neural networks. Different
training methods can produce different final results, e.g.,
different sets of weights describing the attenuation or
amplification factor between nodes. However because it is
conventional to represent weights by a factor in the range
of zero to one, the claim drafter could not conceive a way
to distinguish, in general, the weights produced by the
applicants' method and the weights produced by prior art
methods hence a product-by-process claiming approach was
used.

Examiner responds:

Section 2113 [R-1] Product-by-Process Claims of the MPEP

states that: "[E]ven though product-by-process claims are

limited by and defined by the process, determination of

patentability is based on the product itself." Examiner

finds no disclosure of process of training the neural

network in terms of electrical circuit operations.

Examiner finds no disclosure of estimating derivatives in

terms of electrical circuit operations. Examiner finds no

disclosure of computing the sigmoid transfer function in
terms of electrical circuit operations. Therefore,
examiner considers applicant's "electrical neural network"
to be a mathematical model/algorithm not patentable under
35 U.S.C. §101. Examiner maintains the rejection of claims
1-19 under 35 U.S.C. §101 as abstraction and/or algorithm.

Rejection of Claims 1, 4-7, 11, 13, 14, and 18 Under 35 U.S.C.

§102(b)

Applicant(s) argue(s):

> The method described by Fahlman et al is clearly quite
> different from that recited in Applicants' independent
> claims 1 & 13. Fahlman describes a method according to
> which hidden nodes are added one at a time, and before
> their outputs are connected to the output nodes of the
> neural network, the input weights of the newly added hidden
> nodes are trained to maximize the magnitude of the
> correlation between their output and the output of neural
> network itself. After this correlation is maximized, the
> input weights are frozen and the outputs of newly added
> nodes (which are connected to output nodes), are connected
> and the connections between the newly added nodes and the
> output nodes of the network are re-trained. Thus, Fahlman's
> training never has to contend with training an edge weight
> that is multiple layers deep in a network. In summary,
> because of this latter point claims 1 & 13 do not read on
> the methods disclosed by Fahlman.

Examiner responds:


    Examiner finds applicant(s) argument persuasive and

    withdraws the rejection of claims 1, 4-7, 11, 13, 14, and

    18 Under 35 U.S.C. §102(b).



Rejection of Claims 2, 3, 8, and 15 Under 35 U.S.C §103(a)


Applicant(s) argue(s):

    Claim 2 was rejected under 35 U.S.C §103(a) over Fahlman in
    view of Mashiko (U.S.P. 5,202,956). Claim 2 depends from
    claim 1 and includes all the limitations thereof. For the
    reasons set forth above in respect to claim 1 it is
    submitted that claim 2 is allowable.

    Claim 3 was rejected under 35 U.S.C §103(a) over Fahlman in
    view of Smyth (U.S.P. 6,092,058). The portion of Smyth
    pointed to by the examiner concerns an autoregressive
    filter not a neural network. Whereas the attenuators are
    used in feedback loops of the autoregressive filter
    disclosed by Smyth neural networks such as those disclosed
    by the applicant do not include any feedback pathways. In
    any case claim 3 depends from claim 1 and includes all the
    limitations thereof. For the reasons set forth above in
    respect to claim 1 it is submitted that claim 3 is
    allowable.

        Claims 8 & 15 were rejected under 35 U.S.C §103(a)
    over Fahlman in view of Watrous "Learning Algorithms for
    Connectionists Networks: Applied Gradient Methods of
    Nonlinear Optimization", 1988. Claims 8 & 15 depend from
    claims 1 & 13 respectively and include all the limitations
    thereof. For the reasons set forth above in respect to
    claims 1 & 13 it is submitted that claims 8 & 15 are
    allowable.

Examiner responds:

Examiner finds applicant(s) argument persuasive and

withdraws the rejection of claims 2, 3, 8, and 15 under 35

U.S.C. §103(a).

# Conclusion

Applicant's amendment necessitated any new ground(s) of

rejection presented in this Office action.  Accordingly, THIS

ACTION IS MADE FINAL.  See MPEP § 706.07(a).  Applicant is

reminded of the extension of time policy as set forth in 37

CFR 1.136(a).

A shortened statutory period for reply to this final action

is set to expire THREE MONTHS from the mailing date of this

action.  In the event a first reply is filed within TWO MONTHS

of the mailing date of this final action and the advisory action

is not mailed until after the end of the THREE-MONTH shortened

statutory period, then the shortened statutory period will

expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated

from the mailing date of the advisory action.  In no event,

however, will the statutory period for reply expire later than

SIX MONTHS from the date of this final action.

## Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan H. Brown, Jr. whose telephone number is 571-272- 8632. The examiner can normally be reached on M-F 0830-1700. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Vincent can be reached on 571-272-3080. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Nathan H. Brown, Jr./
Examiner, Art Unit 2129
February 25, 2009
/David R Vincent/
Supervisory Patent Examiner, Art Unit 2129